

## *Turf fields may have ‘forever chemicals.’ Should kids be playing on them?*



Children run drills during a soccer practice in San Diego on Nov. 12. (Sandy Huffaker for The Washington Post)

By [Teddy Amenabar](#), March 12, 2024 at 7:00 a.m. EDT

The three 6-year-old girls stood on the sidelines as their coach swabbed their hands. Then they ran onto a lush green turf field and played soccer for 90 minutes straight — no stepping off the pitch. This wasn't just a practice. It was part of a small experiment conducted in the suburban foothills of San Diego last summer.

Salar Parvini, 44, the children's assistant soccer coach, swabbed his hands too, and shipped the samples taken before and after the practice to a lab in Lancaster, Pa. There, scientists would test them for "forever chemicals," also known as PFAS, a broad class of man-made chemicals linked with a variety of health concerns, from high cholesterol to cancer.

Parvini and his players, all members of the San Diego Surf soccer club, are among the earliest

test subjects in emerging research focused on whether the PFAS in artificial turf pose a meaningful health risk, especially to children, whose developing bodies are particularly susceptible to toxic chemicals.

Debates about artificial turf are happening at school boards, city council meetings and town halls in Massachusetts, New Jersey, Pennsylvania, New Hampshire, California and other states. On one side are some scientists and turf critics who say the presence of PFAS in turf is worrisome, given what is already known about the toxic effects of the chemicals.

But turf advocates and other scientists say there's no reliable evidence showing that PFAS in turf pose a risk. Proponents also say the synthetic fields require less water than grass, don't need pesticides and allow for more frequent competitive play, without the potholes or mud pits that need tending on natural fields.



*Salar Parvini and his daughter Emma at soccer practice. Concerned over PFAS, Parvini tries to limit his daughter's playing time on turf. (Sandy Huffaker for The Washington Post)*

PFAS — which stands for per- and polyfluoroalkyl substances — are used in a vast variety of products and have been dubbed “forever chemicals” because of their ability to persist in the environment for years. They keep food from sticking to pans, make

raincoats and backpacks water-repellent and help carpets resist stains. And they can also be used to manufacture the plastic blades of grass in artificial turf.

Test results from the San Diego soccer kids experiment found that two of the three players — including Parvini's daughter, Emma — came off the turf field with higher amounts of PFAS on their hands than at the beginning of the practice. So did Parvini. When the players practiced on natural grass, the results were mixed: Two of them had a decrease in PFAS, while Parvini was found to have more PFAS on his hands. (The new soccer balls also had detectable amounts of PFAS before they were used on both fields.)

The San Diego experiment was funded by Public Employees for Environmental Responsibility (PEER), a nonprofit that advocates against the use of artificial turf. The data are far from conclusive, in part because PFAS are so pervasive. Tests from Martha's Vineyard, Mass., found that samples of soil from athletic fields had comparable amounts of PFAS to those found in samples of turf. The tests were ordered by a landscape architecture firm that designs both grass and turf fields.

In an email, Melanie Taylor, the president and chief executive of the Synthetic Turf Council (STC), a trade association for the industry, pointed to the tests showing the presence of PFAS in soil. She said that companies are looking for a standardized testing method to guarantee their turf products aren't made with PFAS.

“STC has worked with its members to ensure their products contain no intentionally added PFAS constituents,” Taylor said.

Now, academic researchers are conducting higher-quality studies to determine whether PFAS and other chemicals detected in turf

samples can end up on athletes and pose a risk to their health.

“I don’t think there’s been nearly enough studies to know,” said [Christopher Kassotis](#), an assistant professor in the Institute of Environmental Health Sciences at Wayne State University who is preparing to conduct a study on whether the chemicals found in turf can affect the endocrine system. “There’s very little work here on human exposure, and that’s certainly a piece of the puzzle when it comes to risk.”

Kyla Bennett, the lead researcher behind the tests in San Diego and the director of science policy for PEER, said the results are a “red flag,” and larger studies are needed.

But some parents aren’t waiting around for clearer answers. Parvini has lobbied for local school boards in California to use turf fields made without PFAS. In the meantime, he tries to limit his daughter’s playing time on artificial turf fields.

“If they want to use PFAS in microchips, great. My kid doesn’t eat microchips,” he said. “But if they want to use it in artificial turf and my kid is exposed to it 2,070 hours a year, well, what is that doing to her body?”

## Concerns about turf and chemicals

Artificial turf fields are booming: According to the Synthetic Turf Council, there are about 18,000 turf fields in North America. An estimated 1,500 are installed every year.

To make turf, a plastic resin is heated and extruded through a machine into a yarn. Manufacturers use a lubricant to help with that extrusion process, Joe Fields, the chief executive of TenCate Grass Americas, a turf company in Dayton, Tenn., said in an email. These lubricants have contained trace amounts of PFAS in the past, he said.

Fields said TenCate eliminated PFAS from its manufacturing process to give its customers “complete peace of mind since there are many types of PFAS and much confusion around these various types of PFAS and their potential to effect people or the environment.”

The finished artificial fields have several layers, including an infill — often made of rubber as well as coconut fibers, cork, nutshells or sand — that’s sprinkled between the blades of artificial grass to ensure they don’t get matted down, according to Taylor of the STC.

Researchers and environmental advocacy groups say that years of abrasion from cleats, rain and radiation from the sun could release chemicals from the field, which could expose the athletes or wash off into the environment. But those concerns haven’t been studied widely.

“We still don’t know enough about the effect of weathering,” said [Jonathan Benskin](#), a professor in the environmental science department at Stockholm University, who co-wrote a peer-reviewed [study](#) in 2022 that found signs of PFAS in artificial turf but concluded it didn’t pose an “imminent” risk. (The researchers were unable to extract the chemicals from the material in the lab.)

The PFAS debate is not the first time concerns have been raised about the safety and chemical exposure of playing on turf fields. Nearly a decade ago, a cluster of cancer cases in soccer goalies who played on turf led to questions about the composition of the rubber infill.

In 2019, a [report](#) from the Environmental Protection Agency found the presence of chemicals and a variety of metals, including lead, in rubber infill but did not determine that turf is a risk to human health. And there is an ongoing debate about whether

turf fields pose a greater risk of foot and leg injuries to children and adults alike.

“We’ve always warned people that there are hazards of using artificial turf,” said Sarah Evans, an assistant professor of environmental medicine and public health at the Icahn School of Medicine at Mount Sinai in New York. “Natural grass is a safer alternative across the board.”



*Supporters of artificial turf say the fields allow for more competitive play throughout the year. (Sandy Huffaker for The Washington Post)*

## The debate over artificial turf

In Martha’s Vineyard, plans to install an artificial turf field at the public high school resulted in a years-long legal battle. Critics, including some parents, were concerned PFAS could end up in the island’s aquifer.

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Rebekah Thomson, a 46-year-old mother of three who lives in Martha’s Vineyard, co-founded Field Fund, a nonprofit that advocates against the installation of artificial turf. She has environmental and injury risk concerns about turf and also worries turf fields are much hotter than grass.

“Our children deserve better. They deserve to be on grass and soil,” she said. “They deserve to be on a safe surface for their bodies and for

their future that’s not going to jeopardize the world they live in.”

But Chris Huntress, the president of Huntress Associates, the landscape architecture firm that ordered the soil testing done in Martha’s Vineyard, said he is not concerned about the level of PFAS found in the turf materials he uses in his projects.

“You can dislike turf for a whole lot of reasons. You can say that it’s hotter than natural grass, because it is,” Huntress said. “But you cannot dislike it for PFAS. Because the trace elements that we’re seeing are so small that they’re shown to not have an impact on human health or environmental health.”

Donald Herman, a retired physical education teacher who coached football at the high school in Martha’s Vineyard for 32 years, said teams need an artificial turf field that can handle football, soccer and lacrosse throughout the school year.

“If I thought grass could work here, for our school, I would support grass,” Herman said. “But it doesn’t work here. Not with the use it gets.”



*Some states and local governments, such as New York, have taken action to limit the use of PFAS in turf. (Sandy Huffaker for The Washington Post)*

The synthetic carpet in turf fields need to be replaced typically every eight years, said

Taylor, of the Synthetic Turf Council. Some turf manufacturers have begun recycling programs, she said.

But rolls of old turf fields can wind up in landfills — and some scientists say the PFAS in the turf fields won't easily break down over time.

"These are made to be pretty much indestructible," said Ian Cousins, an environmental chemist and professor at Stockholm University. "They're not natural materials. So, it's not great that they entered the environment. But once they're there, they're not going to disappear."

Paul Makishima, a resident of Milton, Mass., has expressed his concerns over an estimated \$2.5 million project that would involve installing a turf field next to a brook near his home.

"We're worrying about what it's going to do to the wetlands, what it's going to do to the brook and, potentially, to those of us who live around it," said Makishima, who's one of 10 neighbors appealing the town's decision.

Concerns regarding artificial turf have spurred some states and local governments to take action: New York has banned the sale of artificial turf with PFAS, starting at the end of 2026. And bills prohibiting the purchase of new artificial turf fields in certain places, such as schools, have been introduced in Massachusetts and Vermont.



*Some scientists say it will be difficult to make definitive conclusions about turf because PFAS are already so pervasive in the environment. (Sandy Huffaker/for The Washington Post)*

## Unraveling the science

Scientists say it is unclear whether the PFAS in artificial turf can be absorbed by the human body, either through the skin, the mouth or the nose, or because of a scraped knee or elbow. Studies are underway to provide a better understanding of the risks.

In his lab at the University of Notre Dame, Graham Peaslee, a physics professor who frequently tests for PFAS in everyday products, has overseen the study of artificial turf samples and said they have consistently found small amounts of PFAS in the materials tested. He is preparing to submit his lab's findings for publication in a peer-reviewed journal.

"It's not just the players that are of concern, it's the entire communities," he said.



*Kids during baseball practice on an artificial turf field in San Diego. (Sandy Huffaker/for The Washington Post)*

In Detroit, researchers at Wayne State University plan to conduct a version of the tests conducted in San Diego but with a larger set of athletes and a broader mandate — examining all potential chemicals from artificial turf fields. Kassotis, the lead researcher, wants to better understand if the chemicals can affect children’s endocrine systems.

“When you start to have chemicals that can errantly activate or inhibit those pathways, particularly in early life, when those signaling processes are so critical, you can have lasting health effects in all sorts of areas,” Kassotis said.

And the National Institute of Environmental Health Sciences is funding a five-year study focused on “the ingredients and the chemical composition of some of the fields,” said Homero Harari, an assistant professor at the Icahn School of Medicine at Mount Sinai and the researcher behind the study.

Despite these efforts, some scientists say it will be difficult to make any definitive conclusions about turf because PFAS are already so pervasive in the environment.

“Once that turf is installed, you cannot unequivocally attribute any PFAS detected to the turf itself,” said Elizabeth Denly, a chemist

who leads the PFAS initiative for TRC, an environmental consulting firm. (Denly worked with the city of Portsmouth, N.H., to test samples of turf from the manufacturer.)

It’s virtually impossible to analyze any product and not find some trace level of PFAS, Denly added.

Kassotis said he hopes that, in the next decade, researchers will have a better sense of potential human health risks from using artificial turf.

Jeff Gearhart, the research director at the Ecology Center, a nonprofit advocacy group based in Ann Arbor, Mich., is planning to conduct his own study weathering turf samples in the lab. Gearhart said we know enough about the environmental hazards to limit the use of these materials.

“We put these products out into the environment without truly understanding their fate,” he said. “Unfortunately, scientists and public health advocates have to scramble and try to put the Genie back in the bottle on this.”